

THE CONTROL OF SCARLET FEVER

being

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by

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C O N T E N T S.

- I. Introduction..... Pages 1 - 3.
 2. Historical Outline..... Pages 4 - 11.
 3. Symptomatology and Diagnosis
with special reference to
anomalous cases..... Pages 12 - 40.
 4. Control of Scarlet Fever-
Preventive methods of present
day. Weak points of these;
criticism and suggested
modifications..... Pages 41 - 83.
 5. Summary and conclusions..... Pages 84 - 85.
 6. Appendixes..... Pages 86 - 89.
 7. Bibliography..... Pages 90 - 94.
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I N T R O D U C T I O N .

The recent extensive epidemic of Scarlet Fever in London and the repeated outbreaks of this disease in various parts of America and Europe show that its control is worthy of very earnest attention and yet present methods of holding this fever in check leave much to be desired, and more especially is this the case in some of the rural and colliery districts in this country. For example, in Bedlingtonshire, Northumberland, with a population of over 24,000, the crude method of controlling Scarlet Fever is by affixing a large red letter "S" to the outside of the main door of the infected house.

The bugbear of "Return Cases" is still present even in the best Hospitals, though fortunately to a less degree than in former years: mild cases are often passed un-notified or else are notified only when desquamation appears when much of the spreading of the disease has already taken place; and even worse cases after notification are removed to Hospital, there to be isolated in wards both overcrowded and understaffed.

In this matter it is noteworthy to contrast Scarlet Fever with Diphtheria. In the latter case the earliest possible notification is everywhere practised and even doubtful throat cases are often notified as Diphtheria in order that early Hospital attention may be given. And again the

isolation of Diphtheria patients is a matter of greater concern and much more rigidly carried out than in the case of Scarlet Fever.

The reason for this strict control of Diphtheria is to be found in the fact that a definite causative bacillus can be isolated with comparative ease and rapidity so that doubt concerning any case is readily cleared up. Scarlet Fever, however, has at present no known bacterial cause and though a filter passing virus, possibly a member of the haemolytic strepto-coccal group, has been suggested as its originating organism yet no bacteriological diagnosis is possible nor has any even been seen by medical man.

The proved efficacy of early anti-toxin treatment in Diphtheria is a further reason for that disease being better controlled than Scarlet Fever.

Round the question of the isolation period in this fever much dispute has centered and even today, authorities still differ on the subject. Moore of Huddersfield^I would have the time regulated less by the state of desquamation than by the condition of the mucous membrane of the nose and accessory cavities, isolation being allowed to terminate when all affection of these membranes has disappeared.

Newsholme and Newman² advocate detention in Hospital for 6 weeks, and longer if any mucous discharges

3.

continue. Milne³ disregards the stage of desquamation altogether in determining the isolation period for he claims that inunction with eucalyptus oil, twice daily for the first ten days, and afterwards once daily, along with frequent swabbing of the throat with carbolic oil, reduces the period of infectivity and permits patients being discharged within three or four weeks although desquamation has not ceased.

How very defective are present methods in controlling Scarlet Fever is best shown by referring to the sickness rates per thousand of the population from the various infectious diseases. Here it is seen that on an average for the past ten years, Scarlet Fever - average sickness rate almost 3 per 1,000 - has accounted for twice as much sickness as any of the other notifiable diseases.

In the present thesis, I propose to discuss the various methods of control now in vogue, to show the necessity of certain precautions and to illustrate from cases which have occurred under my own observation, the defects in our present system and how these may be remedied.

HISTORICAL OUTLINE.

With these introductory remarks, I now propose to consider the subject first from the historical point of view with the object of showing upon what lines the control of Scarlet Fever has developed, and this can best be done by considering:-

1. The history of this fever's early recognition, together with anomalous cases.
2. The history of sanitary measures adopted.
1. The history of Scarlet Fever's early recognition together with a consideration of anomalous cases.

Before Sydenham's time, Scarlet Fever, Measles, and Erysipelas had been much confused with each other and though absolute proof is wanting, there is little doubt not only that Scarlet Fever had existed, but that it had also caused several epidemics.

Sydenham, by his observation in London from the year 1661 to 1675, was able to differentiate clearly Scarlet Fever from Measles so that from the year 1670 or thereabouts the former disease came to be recognised as a definite and distinct condition. Yet the cases in this outbreak were apparently of a mild character according to Sydenham's account, and he made no reference to throat symptoms.

During the last few centuries Scarlet Fever has been in existence most markedly in European countries, and in Great Britain outbreaks of intense severity have occurred since Sydenham first showed the disease to be a separate entity and Scarlet Fever we now have with us constantly in all our

large towns. The continents of Asia and Africa, however, have been and are even now almost exempt from the disease though America is not so fortunate. North America was first affected by Scarlet Fever in 1735 when an outbreak appeared in Massachussetts, the whole of New England states being affected afterwards. At the beginning of the 19th Century, Canada was invaded by the disease and about 1830 it spread to South America and has since gradually spread over the whole continent.

With respect to anomalous forms of Scarlet Fever, by far the greater number reported are those showing the typical febrile onset, often with desquamation following but with absence of rash. At least ten observers in different places and at different times have commented on the occurrence of such cases. As far back as 1839, Taupin⁴ observed five cases of Scarlet Fever in two of which no eruption was present, and in the previous year⁵ Eislet published an account of a severe case of Scarlet Fever in a girl aged 20 years, in which there was no eruption, although she had a marked desquamation associated with anasarca. Later, in 1857, Buttura⁶ described a case of well marked Scarlatiniform Angina, a copious eruption being present and the disease following a course typical of Scarlet Fever. Four days later, however, a little girl in the same family developed croup with

marked Angina, but there was no eruption throughout the disease; and then five days later a little brother also developed intense characteristic Anginous symptoms, and again no eruption was present at any time. This authority further discusses the opinions of Authors in regard to the possibility of Scarlatina without eruption, and reviews older literature giving reports of cases of Scarlatina without eruption as far back as 1829. It appears that during an epidemic at Loches in 1835, Renaud observed three cases of Scarlet Fever in one family, and here two children had the typical rash, but one child had all the severe symptoms of this disease but no rash.

7

In 1859, Bauer reported an epidemic of twenty cases, one being that of a boy who had severe Scarlatina but no eruption at any time, the patient recovering after having a post-Scarlatinal Arthritis.

English observers have also reported cases of Scarlatina without eruption and other anomalous forms viz:-

8

Anderson

Banks⁹Robinson¹⁰Whelan.¹¹

12

In 1892 Baiss reported three cases in one family with the following history:- the first child was found to have a temperature of 102°F. The next day the temperature was normal but the child had a slight sore throat with some enlargement of the

glands of the neck, otherwise it seemed to be well. There was no desquamation; later, however, and a few days after the beginning of the child's illness, a second child was seized with more severe symptoms, and with an eruption which resembled measles. At this time the third child became ill with a typical Scarlatinal eruption, accompanied by jaundice. Were it not for the last case it would have been difficult to diagnose correctly those preceding. The argument might be put forward in the above cases that unless there was confirmatory evidence such as Otitis, Desquamation, Arthritis, or Nephritis, that these were cases of epidemic Roseola, Rose Rash or Rubella.

13

In 1892 also, Warry reported an epidemic of 150 cases of Scarlatina with sore throat but many with absence of rash, the whole of the cases being traced to an infected milk supply. He believed the cases without rash to be Scarlet Fever for the following reasons:-

1. Many of the patients had desquamation during convalescence.
2. Others had kidney complications.
3. Several had Arthritis.
4. Several had Otitis.

Other chief types of anomalous forms of Scarlet Fever are cases without the febrile symptoms as observed by McClanahan¹⁴ in a series of 150 cases; and examples in which the throat affection may be very slight or even absent.

In addition to the difficulties in diagnosis caused by these anomalous forms of Scarlatina further troubles are occasionally met with in cases of Rubella which sometimes resembles mild Scarlet Fever very closely.¹⁵ In 1900 Dukes described an affection closely resembling Scarlet Fever to which he gives the name of "Fourth Disease" and it is in his opinion quite distinct from Scarlet Fever.¹⁶ Since that time other observers who have had excellent opportunities have carefully searched for the condition he describes but have failed to discover such cases.

2. The History of Sanitary Measures adopted.

Previous to the year 1865 when Glasgow opened its first fever Municipal Hospital, there had been no serious attempt to diminish the prevalence and the mortality of Scarlet Fever by segregation. The second Fever Hospital was opened in Glasgow and in order to be in a better position to cope with cases of this disease when there happened to be an epidemic of such magnitude as to cause comparative overcrowding in these Hospitals, a third Fever Hospital was opened in 1900.

The first Hospital for Infectious Diseases in London, under the charge of the Metropolitan Asylums Board was opened in 1871; now there are at least nine Hospitals of this type and a Convalescent Home, and yet accommodation appears to

be inadequate.

In Boston (U.S.A.) there was no special provision for the isolation of Scarlet Fever patients previous to 1888 when the trustees of the Boston City Hospital erected a pavilion. Owing to the large demand for admission to the Hospital many applicants had to be refused, so it became necessary to provide accommodation for these cases and a large Hospital for infectious diseases was opened in 1895.

The Public Health Act, 1875, made some provision for the spread of infectious disease, power being given to the Sanitary Authorities to cleanse and disinfect under certificate from the Medical Officer of Health or two Medical Practitioners any house or part of a house so filthy as to endanger health, or to prevent infectious disease, to provide Hospital accommodation, a disinfecting apparatus to disinfect clothing, bedding etc.

The Epidemic and Other Diseases Prevention Act of 1883, gave power to the Local Government Board to make regulations in case of epidemic or threatened epidemic disease in England for:-

1. The speedy interment of the dead;
2. House to house visitation.
3. The provision of medical aid and Hospital accommodation;
4. The cleansing, ventilation, disinfection and guarding against the spread of disease.

The Public Health (Ireland) Act, 1878, Section 149, and the Public Health (Scotland) Act, 1897, Section 79, extend similar powers to Ireland and Scotland respectively.

The passing of the Infectious Disease Notification Act in 1889 was a further step towards the prevention of infectious disease. Before the passing of this Act about 50 towns had, under local acts, the compulsory Notification of Diseases, Bolton, Huddersfield, Jarrow and Leicester, being among the earliest to obtain the power. In most instances the obligation of notifying lay both on the medical attendant and the parent or householder; in some instances it lay on the medical attendant alone as in Bury.

The 1889 Act, being optional, it was not adopted by a number of towns and rural districts, but by the passing of the Infectious Diseases Extension Act in 1899, it was made compulsory in every urban, rural and port Sanitary district in England and Wales. Two years before this (1897) the Infectious Disease Notification Act was made compulsory all over Scotland, but in Ireland, the Act is still adoptive. Under the London Act, 1891, The Infectious Disease Notification Act of 1889 is compulsory.

At first there was strong objection to the Infectious Disease Notification Act, 1889, by both the medical profession and the laity, the chief objections being that it caused a breach of

confidence on the part of the medical attendant; that it was a source of annoyance to the individual and interfered with private rights. It was also said that people would not call in medical aid to mild cases of infectious disease or even to severe ones until compelled by the seriousness of the illness. The Medical Practitioners of Chippenham sent a memorial to the L.G.B., and the Wiltshire County Council, stating that as long as the M.O.H. was a private practitioner and held other appointments, they would not notify him. Others said that the fee of 2/6d for notification was insufficient.

The antagonistic feeling towards Hospitals for infectious disease has now largely died away, and these Hospitals are now looked upon by many as very useful institutions, so much so that in many districts from 80% to 95% or even more of the notified cases of Scarlet Fever are treated in these special Hospitals.

SYMPTOMATOLOGY

When the classical signs and symptoms are present the diagnosis of Scarlet Fever is a simple matter to the experienced, but cases that are atypical give rise to more or less difficulty.

In a general survey of the whole question it is necessary to keep in mind the following influences:-

1. Periodicity.
2. Season.
3. Age and Sex.

1. PERIODICITY.

Though the disease is endemic yet the recent outbreak in the London area reminds us that at intervals it tends to become epidemic. The Ministry of Health has made the following communication in the matter:- "It may be stated that epidemics of Scarlet Fever occur at intervals of about 4 or 5 years, and during the inter-epidemic intervals the proportion of susceptible persons undergoes an increase. Scarlet Fever was epidemic in England and Wales in the years 1907 and 1914 and the present epidemic (referring to that of 1919) differs from those of the above years in being of smaller dimensions and in the attainment of the maximum prevalence a little later in the season. The periodic or quasi-periodic appearance of epidemics is probably due to the occurrence of a cycle in the life history of the causative organism and the

increase of the non-immune population - causes which are beyond the sphere of administrative control¹⁸".

2. SEASON.

The seasonal curve of notified attacks in Britain is at its minimum in March and April rising to a maximum in October, but this varies from time to time for the last epidemic was noted to be later than usual and in 1918 the trough of the curve was in August with a crest in January as well as in October - the latter being the higher. As a rule cases occurring in cold weather are apt to be more severe.

3. AGE AND SEX.

The Registrar General has referred to these influences in the disease in the 49th Annual Report, 1886, where it is stated:-

- (a) The liability of the unprotected to infection is small in the first year of life, increases to a maximum about the fifth year after which it rapidly and steadily diminishes.
- (b) The female sex throughout life, the first year possibly excepted, is more liable to Scarlatina than is the male sex.

In my own experience I have seen these facts well exemplified. On January 20th, 1921, I was called in to see Mrs. W. whom I found to be desquamating freely about the hands and chest. I

had not previously seen the woman but I discovered that she was nursing her only child - a baby boy aged 9 months. I questioned the mother very carefully as to her baby's previous health and found no history of any sore throat, vomiting, rash, or fever, and though I thoroughly examined the baby I could find no sign of Scarlet Fever about it.

Another instance came to my notice on March 30th, 1921, when I was called to see a girl Catherine E., aged 7 years. I found her to be suffering from Right Otorrhoea which had begun on the evening of her discharge from Isolation Hospital, where she had been treated for Scarlet Fever. Her brother, George E., aged $2\frac{1}{2}$ years, I discovered had now contracted the Fever but the baby aged 8 months escaped the disease, as also did both parents.

The influence of sex is now very evident to me, for at the present time out of the 22 Scarlet Fever cases now in the Wallsend Fever Hospital, three only are males. Of the 252 patients admitted to the said Hospital suffering from Scarlet Fever in 1919, 1920, there were 158 females and only 94 males

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Johannessen reports that of 185 children under 15 years who were exposed to infection, 28% contracted the disease, while of 314 adults, only 5% were affected.

There are three classical types into which Scarlet Fever is usually divided:-

1. Scarlatina Simplex, the mild type which runs its course without either complications or sequelae.
2. Scarlatina Anginosa, where the throat together With extra-tonsillar and cervical glands are markedly affected.
3. Scarlatina Maligna, a rare condition in which the system appears to become overpowered by the intensity of the poison producing extreme nervous prostration with its attendant "ataxic" or typhoid symptoms. Amongst these cases must be included those of "haemorrhagic" Scarlet Fever.

20

Tron states that during the last 15 years during which 5,000 cases of Scarlet Fever were admitted to the Milan Hospital for Contagious Diseases, there were only four cases of the Haemorrhagic form of Scarlatina. The first occurred in a boy aged 15 years, who on the 16th day of disease developed copious Haematuria, Gingival Haemorrhage. He was treated with normal horse serum; recovery took place after a prolonged period of anaemia. The other three cases which were all fatal, occurred during the first week of Scarlet Fever in women aged 19 years, 22 years and 33 years respectively, and were characterized by the presence of Petechiae, Haematuria and Metrorrhagia. The Necropsies showed Sub-Pleural, Sub-Epicardial, and Sub-Peritoneal Haemorrhages, as well as Haemorrhages in the sub-mucous coat of the intestine and of the uterus..

The Incubation period is comparatively short and may be only 24 hours though the average period is 3 to 5 days, and rarely extends to more than one week. A short incubation period is more frequent with a severe case than with a mild one.

²¹ Watts relates six cases in favour of the view that the incubation period of Scarlet Fever is longer than it is usually supposed. The cases he quotes suggest incubation periods varying from 9 days to 29 days.

Invasion. The prodromal period is characteristic in that it is shorter in Scarlet Fever than in any of the other fevers. The onset is abrupt and the duration of invasion is commonly 24 hours. In children repeated vomiting (without nausea) is met with together with Diarrhoea and rigors or convulsions. Adults complain first of chilliness or rigors with sore throat, headache malaise and prostration. quickly both pulse and temperature become elevated, but the pulse more in proportion than the temperature, the pulse temperature ratio being almost pathognomic of Scarlatina. The skin becomes dry and to the touch gives sensation of very pungent heat. The throat varies with the severity of the attack and the patient may on the one hand complain of soreness about the throat while on the other the throat symptoms may be wholly objective. The more severe

cases often show uniform hyperaemia of pharynx, tonsils and fauces with minute red points on the hard palate. The cervical and submaxillary glands are also enlarged and painful.

These mild throat cases are to be contrasted with the severe variety of Scarlatina Anginosa. In the latter case the tonsils become swollen and coated with exudation about the third or fourth day, and the mucous membrane of the mouth and pharynx shows intense congestion which is accompanied by hoarseness and pain on swallowing. There is also an offensive bloodstained nasal discharge, fetid breath and a foul mouth. The voice may become nasal and deafness may occur.

The cervical glands get very large indeed and the diffuse cellulitis of "tippet neck" may ensue with a fatal result. In such a case Diphtheria may complicate matters or the tonsils and soft palate may necrose.

There are many grades between this extreme type and the mild one.

The eruption appears usually within 12 to 36 hours after the first symptoms of invasion, and the duration of the rash varies from 2 to 10 days. The rash is seen fully developed generally in 12 to 24 hours from its first appearance, and this first appearance is made almost invariably at the root of the neck, over the chest and near the large joints.

There-after it distributes itself over the entire body except the centre of the chin, over the circum-oral zone, the tip of the nose, the palms of the hands and soles of the feet. The eruption consists of minute red dots where the follicles are congested, together with paler surrounding halos which run together giving general suffusion of the skin, bright scarlet in colour and often compared with boiled lobster. On pressure, as on stroking with the finger, a whitish streak develops but quickly disappears - the so called "tache Scarlatinale".

It is important to note that when the rash is fully out, the backs of the hands and sides of the fingers are generally affected. At the height of the eruption there is intense itching or burning of the skin with some swelling of the eyelids, cheeks, hands and feet. In uncomplicated cases the highest temperature coincides with the full eruption. This applies also to constitutional symptoms.

The variations of the eruption are frequent and puzzling. In mild cases the rash may be faint and doubtful or it may even escape notice altogether. When faintly present it should be looked for on the loins or on the chest as the rash is usually more evident in these situations. So mild may the attack be that the rash is absent altogether, a condition which also prevails in

malignant cases and in those with very severe throats. Corlett and Cole reported cases of anomalous Scarlatina in one of which there was no rash present; in another the eruption was confined to small areas and very evanescent and in a third case a secondary erythema was present. Severe cases show many irregularities in the character of the rash and also in the time of its appearance. It may be present in irregular patches, or it may take on a macular form resembling measles. In colour too, the typical tones may become purple or even appear Haemorrhagic - a very rare occurrence. Frequently a millet seed rash of tiny vesicles develops and in a day or two these vesicles become filled with milky fluid.

When the eruption fades it leaves persistent brownish discolourations in the folds in front of the elbows, in the armpits, groins, and popliteal spaces, and these stains may sometimes assist in coming to a diagnosis.

The tongue is a point of great diagnostic importance. At first furred with thick creamy white coating through which enlarged papillae project as Scarlet protuberances, it later becomes red raw as the fur is shed. The tongue at this stage assumes the colour of ripe strawberry, hence the expression "strawberry" tongue. It has also been likened to raspberry and to cat's tongue. An experienced eye can quickly see by the tongue in the

early stages, at what day of the disease the case has arrived.

In uncomplicated cases the fever defervesces by lysis in from 2 to 8 days, the temperature being slightly higher in the evenings than in the mornings.

Desquamation or peeling is even more characteristic than the rash. The overgrown epidermis becomes exfoliated, such "casting off" beginning, as the rash does, upon the neck and chest and usually first seen from the 6th to the 10th day of the disease. In some cases desquamation is completed within a fortnight, but the duration of peeling is very indefinite and may extend over several weeks.

No desquamation is seen occasionally in mild cases but this is of rarer occurrence than the absence of rash; Corlett and Cole²² report three cases of Scarlet Fever in which no desquamation was present. In other cases the exfoliated epidermis may be very fine like flour and of a pseudaminous nature. Reference has already been made to cases recorded by Baiss¹² and Warry¹³ where desquamation was either not present or only very faintly evident. At the beginning of the year a case, R. O'H., already desquamating was brought into Hospital. Inquiry at the family Doctor's house revealed the fact that a fortnight previously a younger sister had what was thought to be a thorough cold,

accompanied by sore throat and some vomiting, but at no time had either rash or desquamation been seen. The elder sister had an undoubted attack as she later developed Arthritis and Nephritis, but the younger sister got off with a few days indisposition.

Of the many aberrant forms of the disease, the commonest is the abortion type, showing nothing but sore throat. ²³ Trousseau called disguised or latent Scarlet Fever "Scarlatina fruste".

The malignant type (Haemorrhagic or Ataxic) is very difficult to diagnose merely from signs and symptoms, but a clue is often given either by the prevalence of the disease or the occurrence of milder cases in the same house.

Relapses, recurrences, and second attacks may occur although infrequently. A patient, Nancy T., aged 7 years, was brought to our Hospital on September 19th, 1920, and on admission I found a well marked Scarlatinal rash over the trunk, and upper extremities and a clearly defined circum-oral pallor, together with fever ($T. = 101.4^{\circ}$). She had been vomiting the previous day and had complained of sore throat. The family Doctor had been called in the same evening and had prescribed a mild gargle. The fever ran an uneventful course until November 6th, when the child was in the convalescent ward prior to discharge. On this date she again began to vomit and she told the nurse she felt cold and had a "sore head". Her temperature

was found to be 99.2°F , and the child was put to bed. The following morning my attention was drawn to the little girl and I found a definite scarlet rash present over the chest and arms, with the furred tongue of scarlet and a general hyperaemia of the fauces. Though the child had desquamated after the first rash a second desquamation followed beginning behind the ears and spreading over the body. On November 25th, the 20th day of the recurrent attack albuminum was present and persisted for two days, but apart from this there were no other complications, and the child was discharged on December 29th, 1920, cured.

²⁴
Vysoky in 748 cases of Scarlet Fever had six cases with a relapse and one with a second attack. The relapses occurred on the 12th, 13th, 14th (2 cases) and 19th days (2 cases) respectively, and the second attack a year after the first. The relapses were preceded by an apyrexial interval of several days. In two cases the relapse followed necrotic angina and in another case it occurred three days after an eruption of Varicella. In all cases the rash of the relapse was accompanied by the characteristic symptoms of Scarlet Fever - namely appearance of fever and sore throat, strawberry tongue and desquamation. The course of the relapses was favourable; five recovered and the fatal case was complicated by suppurative Otitis, Rheumatism, Nephritis, and Septicamia. The second attack developed three days after a burn of the second and

third degree, affecting almost the whole of the front of the body.

25

Kinnicutt (New York) observed two attacks within 8 months in a boy of 5 years.

26

Pritchard (Glasgow) tells of a patient who had three attacks within two years. Relapses and recurrences are occasionally seen during the second and third week, and are usually milder than the initial attack. Although Korner²⁷ mentions eight cases where a fatal result followed recurrence of the disease.

28

Newsholme has also drawn special attention to such cases.

In diagnosing a second attack, it is necessary to have typical symptoms so that error may be eliminated.

The blood in this disease shows leucocytosis and in some cases the differential blood count shows a high percentage of eosinophils, a fact observed by Van der Berg,²⁹ and also by Kotschetkoff.³⁰

Dohle's bodies appear in the cytoplasm of the polymorpho-nuclear leucocytes in some cases of Scarlet Fever during the acute stage but they are not regarded as pathognomic of Scarlet Fever as they may occur in other conditions producing a rapid increase in the number of polymorphs.³¹ Kolmer reports the occurrence of these bodies in the polymorphs in cases of diphtheria and erysipelas as well as in

Scarlet Fever and he regards them as indicating a definite reaction in streptococcic infections.

DIFFERENTIAL DIAGNOSIS.

Difficulties are experienced due to:-

1. The throat condition either before the rash appears or where the rash is absent.
2. The Rash.
3. The Desquamation.

1. It is impossible to be sure of a case until the rash or other typical symptoms appear. The pulse-temperature ratio for instance, is met with in diseases where the temperature is elevated such as, in Diphtheria, Measles, Acute Pneumonia or even Acute Tonsillitis. A clear history of recent exposure to infection is of considerable help.

From Diphtheria, cases of Scarlatina Anginosa may give rise to doubt especially where the rash is late in appearing or absent altogether. Clinically the following should be noted:-

In Diphtheria the temperature is raised at the onset but falls quickly, only rising again with extension of the membrane or the occurrence of some complication. Delirium is met with only exceptionally. The membrane on the fauces is clearly defined and frequently limited, and on removal leaves a bleeding surface. Ulceration is not common and the glands while being moderately enlarged show no tendency to become matted together nor does the skin become inflamed. Antitoxin improves the condition locally and generally. A swab of the throat reveals the presence of the

klebs-loeffler, bacillus, bacteriologically.

From Tonsillitis, Vincents Angina and other kinds of faucial inflammation and from certain acute diseases such as Pneumonia, the clinical signs, symptoms, and bacteriological aids with a little delay, decide.

The following case in a neighbouring sanitary district was recently brought to my notice and is illustrative of the difficulty frequently experienced with throat cases. George D. (Aged 8) was discharged from Hospital apparently well after an attack of Scarlatina. Two months later this boy developed what the parents thought to be a cold. No medical help was called in so that it cannot be positively asserted that the following cases in the same family arose from infection from the boy, but the suspicion that the boy still harboured the germ is justifiable. James D. (Aged 18 years) a week later developed Tonsillitis with general faucial hyperaemia though there was neither vomiting nor rash at any time. E.D. (Aged 15 years) and A.D. (Aged 12 years) within the following week were down with definite Scarlatina and were forthwith removed to Hospital. James D. was kept at home until desquamation clinched the diagnosis.

Another case indicating the difficulty caused by throat cases and occurring within our own Borough during April, 1921, is instructive. John R. (aged 21 years) became "out of sorts" and

developed sore throat with painful deglutition. The family doctor was called in and on referring to him I find that he treated the case as a suspected quinsy. On April 7th, 1921, five days following the onset of John R's attack his elder brother Edward R. (aged 26 years) was admitted to Hospital having developed a typical Scarlet Fever rash with T. = 102.2° pulse 102, furred tongue and general inflammation of fauces extending over the soft palate posteriorly. With the permission of the family Doctor, I called to see John R. and carefully inquired into the history of his sore throat which he had suffered from just 14 days previously, and found that apart from slight malaise there were no other symptoms such as one would look for in a genuine case of fever. My examination of him revealed no evidence of desquamation, and I elicited no details of any complication suggesting the primary condition to have been Scarlet Fever.

2. The rash:-

In this connection the following eruptions should be borne in mind:-

- a. The well known eruptive infectious fevers.
- b. Other Infectious Diseases.
- c. Sepsis and other infective processes.
- d. Drugs.
- e. Intestinal or other causes.

a. From eruptions occurring in the well-known eruptive infectious fevers:

Measles - A prodromal rash sometimes occurs usually confined to the trunk, closely simulating the eruption of Scarlet Fever. The initial Catarrh, Kopliks spots and Leucopoenia are diagnostic.

Chicken-pox occasionally shows an initial rash usually confined to the trunk, similar to that of Scarlatina but either at the same time or quickly following it, the vesicular eruption is found.

Small-pox may have an initial rash of two kinds namely Erythematous or Petechial, which may simulate Scarlet Fever. The Erythematous one appears on the first or second day and may be limited to the joint regions and small areas of the trunk or it may spread over the entire body. It is not so markedly punctate as that of Scarlatina and is unusual in young children.

The Petechial rash which is diagnostic of Small-pox especially affects the abdomen below the umbilicus and the upper aspects of the thighs. These two initial rashes may be combined. The initial symptoms of Small-pox such as intense frontal headache, lumbar pain, aching of the limbs are diagnostic. The Haemorrhagic form of Scarlet Fever is distinguished from Haemorrhagic Small-pox by a history of exposure to other cases of Scarlet Fever, the mode of onset, the behaviour of the temperature, and the symptoms shewn on the day of appearance of the eruption.

Rubella gives rise to most trouble. In

epidemic years it occurs especially from March to June in this way differing from Scarlet Fever. The rash in rubella begins on the face as small discrete pink spots quickly spreading to the trunk and upper limbs and lastly to the lower limbs. On the second day the rash will have faded and have lost its 'spotty' character on the trunk where it has by this time assumed the form of a diffuse erythema, frequently punctate. Discrete spots will still be seen over the lower limbs which will help at this stage to distinguish from Scarlatina. Other signs of diagnostic importance are the conjunctivae frequently injected, the enlargement of glands and particularly the posterior cervical, only slight sore throat, very mild constitutional symptoms, vomiting rare and no circum-oral pallor.

In March 1919, I witnessed an outbreak of several cases at Pitlochry in Perthshire where an epidemic of German Measles was then subsiding. Two children in one house developed a rash similar to that of Scarlet Fever but the constitutional symptoms were so slight that, with the presence of other cases of Rubella in the district, the diagnosis of Scarlet Fever could not be entertained.

b. From other Infectious Diseases.

Erythema of Diphtheria. This is occasionally seen on the second to sixth day of illness and is not accompanied by a corresponding rise in temperature. The rash occurs as a perfectly even bright-red flush

non-punctate and followed by no desquamation. It is important to bear in mind that anti-toxin frequently produces an eruption, and sometimes a flour-like desquamation.

William A. (aged 7 years) was admitted to Hospital on March 11th, 1921, when I found him to be suffering from Diphtheria, a diagnosis which was confirmed by two successive positive swabs. No rash was evident and on admission 4,000 units of antitoxin were administered. On the third day after admission I found a general suffusion of the skin in the region of the thighs and trunk but only faintly evident below the elbows and knees. Though the rash had areas in the dorsal region strongly suggestive of Scarlet Fever yet neither the tongue nor the glands were affected and the pulse and temperature were not disturbed. Later a limited desquamation followed.

Erythema of Influenza. In this connection it is necessary to exclude the possibility of drug

³²
eruption. Whitfield in the epidemic of 1891-92 saw several cases, the rash occurring during the first few days with desquamation following in some of them.

³³
Hamilton published in 1905 a series of similar cases but the rash though Scarlatinal was not followed by

³⁴
desquamation. Gioseffi during the Influenza epidemic of October, 1919, treated 12 cases of Scarlatiniform rash which he believes were of influenzal origin and not true Scarlatina. Factors against Scarlatina were the absence of nephritis (only 1 case had albuminuria) strawberry tongue or

suppurating cervical glands, the common association with coryza, the furfuraceous nature of the desquamation, and the fact that several infected cases developed all the other symptoms (sore throat, coryza etc.) but showed no rash. None of the cases having a rash was fatal, and the epidemic came to an end at the beginning of November when true Scarlatina is usually starting rather than declining.

In February, 1919, I was called to see John McL., a farmer, and found him to be suffering from marked constitutional symptoms ($T = 103.2^{\circ}$; pulse 102) with sore throat and a rash of the dual constitution of a Scarlet Fever eruption but confined to the abdomen and lumbar regions extending from $\frac{1}{2}$ " above the umbilicus to the pubis anteriorly, and posteriorly to a similar extent though spreading also over the buttocks. These symptoms were associated with a history of pains in the back and legs three days before the rash appeared, with marked coryza and on examining the lungs I found moist râles at both bases and a small area of Pneumonia on the right side below the root of the spinous process of the scapula. These facts together with the epidemic of Influenza in the district at that time, led me to the conclusion that the case was not one of Scarlatina, though a week later I found desquamation present, but this too was limited to the areas mentioned above.

35
Erythema of Malaria. Genoese remarks

that various cutaneous eruptions are not uncommon in

malaria - for example, Herpes, Urticaria, Morbilliform rashes, Erythema Multiforme and Pemphigus. Examples of Scarlatiniform rashes in Malaria were described by Morton in 1696 and by Borsieri in 1785. Genoese reports a case in a child aged 6 years, whose father and mother were suffering from malaria. In addition to a generalised Scarlatiniform eruption the child presented signs of Meningitis. The cerebro-spinal fluid was under increased pressure and showed considerable lymphocytosis. Lumbar puncture was followed by injection of 0.5 gram of quinine and the eruption disappeared immediately.

Erythema Infectiosum - Scarlatinoid - Fourth Disease.

These appear to be the same disease but authorities are not agreed as to its existence. Reference has already been made in this connection¹⁶. The rash which is Scarlatiniform begins on the cheeks and does not affect the circum-oral region. There is nasal catarrh; fall in temperature in 24 hours with rapid fading of the rash. The state of the mouth pharynx, tonsils, tongue and face, are similar to Scarlatina. Desquamation occurs but there are no complications and children are specially prone to the disease.

c. From Sepsis and other infective processes.

Eruptions due to the use of various antiseptics in surgical dressings are to be excluded

and it should be remembered that after operations (major and minor) confinement or trauma, erythema may develop. This condition though it has been called "Surgical Scarlatina" is now recognised to be a septic poisoning. A punctate rash begins round the wound and spreads centrifugally for a time and then extends symmetrically showing a special tendency to affect extensor aspects of limbs. In the flexures however no brown staining is left and accompanying sore throat is unusual. General symptoms however are severe. In August 1918, J.B., aged $3\frac{1}{2}$ years was admitted late one evening to the ward for which I was House-Surgeon. She had a compound fracture of the left arm which was treated with all antiseptic precautions, within two hours of admission by the Assistant Surgeon. After three days it was found that the wound had become a little septic but there was no sign of any constitutional disturbance. On the 16th day after admission, however, the temperature rose to 103.2° and the pulse to 120, the wound showed a zone of inflammation around it with a few discrete punctate spots. The following day, the punctate rash having become generalized, the child was removed to the City Hospital for Infectious Diseases where I found afterwards that she had been kept in a side ward away from the ordinary Scarlet Fever patients. She returned to the Infirmary at the end of a month, no desquamation having been seen nor any Scarlet Fever complications having ensued.

At no time were found signs (either objective or subjective) of sore throat nor was there any typical strawberry tongue.

Patients with recent wounds unless protected by a previous attack, if exposed to contagion, are peculiarly susceptible to Scarlatinal poisoning. In October 1914, Scarlet Fever infected a surgical ward at the Aberdeen Royal Infirmary, and two cases R.S., aged 21 years, and J.A. aged 43 years were removed to the Aberdeen City Hospital for Infectious Diseases. On admission R.S., who had been operated on for left undescended testicle and Inguinal Hernia three days previously, showed a well defined Scarlatinal rash with sore throat and furred tongue, constitutional symptoms being more severe than usual ($T = 104.2^{\circ}$; pulse 122). The wound was very inflamed and the stitches showed small points of sepsis, the scrotum being much enlarged. Five days after admission he died, having shown no favourable constitutional symptoms from the day of admission. No desquamation was noted. The other case J.A., was admitted to the Fever Hospital a week after an abdominal operation at the Infirmary. On admission a faint but typical Scarlatinal eruption was found over the chest and upper extremities; the tongue was raw-red at the tip and edges, the papillae being enlarged; the throat was congested over the fauces and the tonsils were enlarged but not markedly so. The wound showed slight inflammation around it. Constitutional symptoms were not more

evident than in the case of a mild Scarlet Fever patient. At first he appeared to improve in health, the rash clearing, the throat losing its hyperaemia and the temperature falling to 97.8° with a correspondingly healthy pulse. Fine desquamation was noted over the chest on the seventh day after admission, when it was also found that the temperature had become elevated (102.8°) and mild maniacal symptoms developed; during the next two days these became more exaggerated and the patient died on the evening of the ninth day.

Watton Browne (Belfast)³⁶ has placed on record several such cases. A healthy child, 16 hours after operation for hare-lip developed a dark Scarlatinal rash, and quickly died. Another patient who, it was afterwards learned, had been recently exposed directly to Scarlatina, was circumcised. In 30 hours he was covered with a Scarlatinal rash and had a temperature of 104° F. In 40 hours the wound became gangrenous, coma set in and death in 70 hours. A child with lacerated wound, was accidentally placed in a bed next to one in which was a patient who had just developed Scarlatina. The exposure lasted less than an hour, but in six hours the child began to vomit, and this was accompanied by high fever and headache; became comatose and died in 15 hours, no rash having appeared. After death however, a purpuric rash was seen upon the skin. Beggs³⁸ reports similar cases.

To differentiate between Erythematous Septicaemia and Scarlet Fever in such cases, it is necessary to have something definite to help in the diagnosis, viz., history of exposure to infection, throat symptoms, nephritis, desquamation or contagion.

Erythema with Tonsillitis. When these two occur together a mistake is likely to be made at the beginning. Whitfield³² reports two cases:- In the one the attack began with Tonsillitis and high temperature. Twenty-four hours later a punctate rash was observed first on the throat and neck and later on the limbs. This rash was not uniform but left off with very sharp margins. No brownish staining of the flexures was left nor was there either subsequent desquamation or spread of infection. In the second case the patient became suddenly ill, developed Tonsillitis and Fever, and within 24 hours a Scarlatinal rash appeared on the neck and arms. On the fourth day of illness the rash was seen also on the chest and the temperature was still raised. There was yellowish staining on pressure and browning of the flexures. The face was desquamating freely especially in the circum-oral region and about the chin. The tongue was furred but not white strawberry in type. The evidence of peeling before the fading of the rash decided against Scarlatina. Desquamation of the body followed and again there was no spread of infection.

Erythema of Secondary Syphilis. That

difficulty does arise in differentiating this rash from that of Scarlatina will be seen from the following example that occurred in my own district on August 14th, 1921. That day a local practitioner called me in for consultation about a patient of his, Mrs. B. (aged 28 years). She had been suffering from what was thought follicular tonsillitis for five days prior to my visit, and the family doctor told me a rash had appeared about the neck on August 13th. On examination I found a pale and diffuse erythema present over the trunk, arms and thighs; the legs, feet, hands and fore-arms showing no such general reddening. The face was not flushed nor was any Circum-oral pallor visible, though a papular eruption was present on the left cheek at the angle of the mouth. Discrete glossy papules were everywhere present. The tongue was furred but the papillae were not enlarged so that there was nothing to lead one to attribute its present appearance to Scarlet Fever. Round the neck was tied a piece of "Thermogene" wool. On removing this I found a bright Scarlatiniform rash, the eruption noted by the family doctor on the previous evening. On enquiry I found there had been a slight vaginal discharge present and on examination I palpated enlarged epitrochlea glands on both arms and also drew the Doctor's attention to condylomata on the vulva.

While that part of the eruption most like the rash of Scarlet Fever - viz - that

affecting the neck - was probably due to the irritant action of the "Thermogene" wool, I had no doubt in attributing the rash of the rest of the body to secondary Syphilis.

Erythema with Gonorrhoea. Some rashes of Scarlatinal character are seen in cases of Gonorrhoea. In these cases it is especially necessary to exclude drug rashes and that of Copaiba in particular. The diagnosis from Scarlatina is a simple matter from the history and general symptoms.

d. From Drug Rashes:-

Enemata. Ordinary hard (sodium) soap occasionally produces a Scarlatiniiform rash within 24 hours of the administration of the enema. Usually it appears first on the buttocks and then on the extensor surfaces of the limbs. There are neither signs nor symptoms to suggest Scarlet Fever.

Anti-toxin Serum. A Scarlatiniiform eruption is not a common type and when it does occur it begins at the site of injection and there is no accompanying rise in temperature.

Belladonna, Quinine, Opium, Veronal, Mercury, Potassium, Iodide, Antipyrine, The Salicylic Compounds and others.

Rashes from drugs are unlikely to behave exactly as in Scarlatina, the cardinal signs and symptoms of this fever being absent.

e. From other eruptions.

Erythema in young children, usually patchy and frequently non-punctate in character,

without accompanying temperature or sore throat and very transient, is easily differentiated from true Scarlatinal eruption. The causes of such rashes in children are often the wearing of flannel and, it may be, even vigorous screaming.

Erythema Scarlatiniforme and Erythema Scarlatiniforme recidivans.

The causation of this condition is unknown though possibly it is of alimentary origin. Sore throat, vomiting and pyrexia are present together with a Scarlatinal rash, which however is patchy and confined chiefly to the trunk. The rash persists for some time as a rule and before it has faded desquamation begins. The circum-oral pallor, so evident in Scarlet Fever is not a marked feature in this disease. In the relapsing or recurrent form the history of repeated attacks is of assistance.

3. Due to Desquamation.

It has already been noted that every case of Scarlatina does not desquamate and hence of itself desquamation may indicate one of the many conditions. Examples are - Measles, Rubella, Dermatitis, Antitoxin, and other Erythematous rashes. A patient .W.A., aged 7 years was admitted to Hospital on the evening of March 11th, 1921. He had a temperature of 99.6°F: pulse 100: throat patched with grey membrane over both tonsils which bled when I removed the membrane and a spot of membrane on the uvula. I injected 4,000 units of antitoxin into the

left thigh on the evening of admission. By the end of the sixth day after admission to Hospital, the throat was clear and no untoward symptoms developed. Two days later however a fine branny desquamation was observed over the chest and extremities but at no time did either the soles of the feet or the palms of the hands show any sign of desquamation. Nothing else suggestive of Scarlatina was observed at any time, and the peeling was undoubtedly caused by the injection of diphtheritic antitoxin. I observed while in the City Hospital, Edinburgh, that it frequently occurred that antitoxin taken from boxes with the same index number produced desquamation and it would appear from this that the particular horse serum rather than either the antitoxin itself or the reaction of special individuals was the cause of the subsequent peeling. "Pin-hole" desquamation especially if accompanied by shreds of skin about the finger and toe-nails, ears etc., is very suggestive of Scarlatina while any other history such as sore throat, otitis, rhinorrhoea, nephritis or the like clears up the diagnosis.

C O N T R O L.

General principles of Preventive Medicine are now being more and more applied to individual diseases and I have endeavoured to show how very essential it is that Scarlet Fever should be studied from this prophylactic stand-point. This disease may be so treacherous in its remote effects and so uncertain in its ultimate outcome that it becomes a matter of great importance to prevent its spread. Every means of prevention must therefore be sought out and adopted towards this end.

In the first place it is necessary to consider in detail the mode of infection. The chief source of infection is the patient himself but what the original source may be it is difficult to tell.

³⁹Hammer has several times in his annual reports referred to a relationship between periods of prevalence of fleas and the prevalence of Scarlet Fever amongst children. He has kept records of flea prevalence in common lodging houses over a continuous period of 10 years, and he finds that if the curve for flea prevalence be post-dated by one month an unmistakeable parallelism is found between it and the curve for Scarlet Fever prevalence, a similarity which does not occur in the case of Diphtheria prevalence. The interval of one month between the maxima of flea and Scarlet Fever prevalences is suggested as being due to either a

single factor such as meteorological conditions or else the interval may be taken to represent evolution of a Scarlet Fever germ. In either case the facts imply that conditions favouring flea prevalence are either identical or intimately associated with the prevalence of Scarlet Fever.

A point of some importance in this connection is the fact that there is an undoubted tendency, at certain times and in certain localities for Scarlet Fever to occur in households and in schools where the standard of cleanliness is by no means a low one. ⁴⁰ Robertson in his annual report for 1913 remarks:- "Scarlet Fever is less a disease of the squalid areas than it is of the suburbs". As an explanation of this apparent paradoxical result, Hamer suggests that failure to notify cases in poorer districts may account to some extent for unexpected figures, and also children of the ages at which Scarlet Fever incidence is highest, are more in the poorer districts so that one case would show less in proportion here than it would in better class districts where such children are comparatively few.

The Scarlatinal infection is regarded as residing in the throat, nose, and accessory cavities, and probably in the skin of the patient affected. Through the acts of swallowing and inspiration the Scarlet Fever virus is conveyed to

the pharynx and tonsils where in the presence of warmth and moisture it develops in a susceptible individual. The poison may be conveyed by the breath by discharges from the affected mucous membranes, by the scales during desquamation and probably by all the excretions, urine, faeces and perspiration.

Besides this direct method of infection by the patient the disease may be spread indirectly by means of the attending nurse, the doctor, clothing and bedding, toys, domesticated animals, carpets, food (especially milk) and feeding utensils. Articles such as these retain their infection for an indefinite period and may carry the infection to any part of the country. Where houses are close together bedclothing while airing in the window, has been⁴¹ known to convey the disease to an adjoining household. A bouquet of flowers sent from a sickroom to an institution proved a vehicle of infection.⁴¹ The washing of infected with other clothing is also a means of spread. Milk is a well known carrier, and instances of milk epidemics such as at Wimbledon,⁴² in Surrey,⁴³ and in Marylebone, are common. In the last case the epidemic was investigated by Klein and Power in Marylebone in 1885, and it was traced by them to milk from a Hendon dairy in which the cows were found to be suffering from a vesicular affection of the udder and teats with mild constitutional disturbance. Klein

has shown that the microcci found in such milk are identical with those found in Scarlatina and that they may be capable of producing disease in animals.

Outbreaks of a similar type have occurred in other parts of England, in Stirlingshire and in Glasgow.^{44,45.}

Williamson (M.O.H. Edinburgh) reporting on a recent Scarlet Fever outbreak has shown that an epidemic of 337 cases had the characteristics indicating that the milk supply was involved, a remarkable feature being that the infection was traced to no fewer than four separate milk supplies.⁴⁶

The usual source of milk infection, however, is derived from a human source either in the dairyman's household or amongst those having the handling of milk vessels.⁴⁷ Wood writing about Scarlatinal epidemics has shown the importance of private individuals returning uncontaminated milk-vessels to the milk vendor.⁴⁸ Corfield has traced infection to a tin of milk. There is no evidence of the infection being spread by water or by air currents, nor has there been any definite relationship established between soil and Scarlet Fever although Boobbyer has recorded a series of cases the incidence of which appeared to be determined by disturbance of the soil.^{49.}

In order that infection should occur there must be:-

- (1) A suitable condition of the "soil".

- (2) A germ of necessary virulence to thrive in such soil.

There is in all probability a diminution in the infective potency of the specific virus with an associated attenuation in morphological structure, after several removes, and this would account for the ending of Scarlet Fever outbreaks, the beginning of such epidemics being due to renewed virulence of the causal organism. I have already referred to the cyclical occurrence of the disease and it would appear that the usual sequence of cases does not extend beyond four or six removes, the earlier and the later cases being milder and less marked, the middle members of the series being more severe and pronounced.

Duration of Infection - Scarlet Fever is infectious from the beginning of its invasion, is greatest at the fastigium and thereafter gradually declines but at what period a case is free from contagion is, in the absence of definite bacteriological knowledge, a very difficult point to decide so that a hard and fast rule cannot be laid down as to the number of weeks or days Scarlet Fever is infectious. Each case needs to be judged on its own merits. That infection ceases with the end of desquamation has long been known fallacious and such well established facts as that the contagion is really derived from the throat, the nose and the ear, and also that desquamation in the

later stages at any rate may be disregarded, have modified old opinions. Millard⁵⁰ (M.O.H. Leicester), Robertson⁵¹ and others regard five weeks as sufficient in mild uncomplicated cases, remarking also that they have found no increase in the number of cases carrying infection out of Hospital through shortening the period of isolation of mild uncomplicated cases from six or seven weeks to five weeks. Other cases must be considered infectious as long as any discharge remains. A chronic pharyngeal catarrh, especially in winter, may contain germs of infection for a long time. Rhinitis, chronic pharyngitis, purulent otitis suppurating glands, eczema, empyema, and possibly also the urine in nephritis, give rise to late infection, and such cases may continue contagious for several months. An outbreak of Scarlet Fever in a surgical ward is reported to have followed the opening of a post Scarlatinal empyema; another case in which Scarlatina was communicated through a purulent nasal discharge after eleven weeks and other cases, where the source of infection seemed certain, show the lapse of more than a year between the first and second cases.

"Return" cases and "Secondary" cases.

In the absence of more exact bacteriological knowledge concerning Scarlet Fever little progress can be expected towards making impossible the presence of return cases which now

occur in the porportion of 2% to 4% in the larger and better equipped Hospitals and to a decidedly greater extent in the smaller Hospitals which are not so well staffed as a rule. On careful examination clinically a case may be certified cured, and relieved from isolation, but any case may prove to be a "carrier" and spread infection to others in contact. Nasal discharge, resulting from a cold in the head is in all probability the cause of renewed infection.

Secondary cases frequently occur after the isolation of the original case, the specific poison not having been properly eradicated from the house.

Both return cases and secondary cases are found most commonly during the early weeks, but as I have already noted, return cases may occur after the lapse of a year. The case of George D. previously mentioned (page 26) would appear to be a case in point. ⁵² Nash reports the case of a person who, twelve months after an attack, developed a cold with nasal discharge, and although he himself showed no symptoms of Scarlet Fever at that time, he infected two others in the house. Nash is of the opinion that a person may be a "carrier" in two ways (a) he may be a carrier of a virulent germ; (b) he may harbour a non-virulent germ which may become virulent when his own health is impaired. This subject is dealt with fully by Professor W.T. Simpson and Dr. Cameron.

"Missed" cases, missed on account of the mildness of the attack and missed by the parents and it may be even by the medical attendant, constitute a very frequent cause of spread. Teething and stomach troubles often get the blame of producing a mild rash and desquamation in such cases is overlooked or, through ignorance, it may be passed over without a thought. Illustrative cases in this connection are not required as every doctor in practice comes across them from time to time. Children who are brought to the surgery with complaints of rheumatism, debility, and being "out-of-sorts", are often found to be desquamating or suffering from nephritis of Scarlatinal origin. Such missed cases are more frequent at the beginning and at the end of an epidemic, though, as the outbreak wanes, they are more likely to be recognised. As an instance of the spread by missed or mild cases, Maxwell Ross (M.O.H. County of Dumfries) ⁵³ refers to a sharp outbreak in his area the chief sources of which he thinks were mild unrecognised cases, for in five instances contact with a person later diagnosed as Scarlatinal was proved and six cases were of the nature of "returns".

The epidemiology of Scarlet Fever is a matter of great importance and in this connection it is well to bear in mind that it takes something more than a virus to bring into being an epidemic disease and that other factors whether in man himself or in his environment are capable of measurement and their

combined effects capable of prediction.

The seasonal variations and the rythmical prevalence of Scarlet Fever over a period of years have already been referred to (page 13) and ⁵⁴Freemantle who notes also a thirty year tide in the disease, lays stress upon these regular variations. He points out that much prevalence (and frequently much malignancy) was seen in the years 1801-4, 1834, 1861-70, 1900-2. The explanation of this thirty year wave is probably due to the fact that persons of susceptible age are entirely a new generation about every thirty years. The five yearly prevalence is due to the replenishing of susceptible children and the seasonal ripple has been explained by Hamer as being due to the agency of fleas, or possibly flies also, both of which are prevalent in the autumn, and a further factor appears to be compulsory attendance at School. The epidemiology of Scarlet Fever is very worthy of attention and is still further dealt with by ⁵⁵Whitlegge and ⁵⁶Hamer.

To what is the continued prevalence of Scarlet Fever due ? Some of the chief reasons are:-

- (1) Ignorance of the public as to the means of spread and consequent imperfect isolation;
- (2) The absence of a prophylactic inoculation such as has prevented Typhoid Fever and Smallpox.
- (3) The herding together of people and of children of susceptible age whether it be at picture houses, at school as the result of compulsory education or elsewhere.

(4) Increased travelling facilities.

Reference will be made later (page 56) to the first of these reasons. Concerning the second cause of the continued prevalence of this disease there is, I believe, every prospect of such a prophylactic inoculation being found at an early date but even with this done it would yet take a considerable part of a century to overcome the ignorance and prejudices of the public in such a matter. Such has been the case with vaccination against smallpox and such is the case with the control of Diphtheria at the present time where the positive Schick reaction followed by toxin-anti-toxin injections is proving a most reliable means of prevention.

Already prophylactic inoculation has been practised in Japan by Takahashi⁷⁸, who during an existing epidemic of Scarlet Fever gave hypodermic injections of 0.001 c. cm. or less, of blood from a Scarlet Fever patient to each of his five children, aged between ten and three years; after five weeks, during which there was no reaction, four of the children were given hypodermic injections of 0.15 c.cm of blood from a Scarlet Fever patient, without any reaction. The youngest child received 0.075 c.cm. at the same time without any reaction. Later the throats of two of the children were, in addition, smeared with a mixture of faucial secretion and blood from a Scarlet Fever patient and here again the result was negative. Control monkeys however

injected subcutaneously with the same material showed the symptoms of experimental Scarlet Fever in monkeys.

While it would be folly to advocate whole-sale prevention on the lines indicated above owing to so few cases having been taken, the above experiments never-the-less indicate that there is good hope of such prophylactic inoculation being a most effective means of controlling Scarlet Fever in the future.

In connection with the last two reasons for the continued prevalence of Scarlet Fever, reference must be made to Nielsen's investigation of the morbidity and mortality of Scarlet Fever in Denmark since 1877. ⁵⁷ He shows by comparing the incidence of the disease in Copenhagen, provincial towns, and the country, that any slight tendency Scarlet Fever may show to die out is counterbalanced by the migration of the population from country to town, the frequency of the disease being directly proportional to the density of the population. He notes also that his study of epidemics of Scarlet Fever showed that children of school age were the first to fall ill and only at a later stage of an epidemic did children under five years develop the disease in considerable numbers. At the same time though school children would appear to bring infection to the younger children he does not think they necessarily contract the disease at School. ³⁹ Hamer similarly favours the assumption that Scarlet Fever prevalence works slowly round from borough to borough



in the metropolitan area, the central and poorer parts serving as reservoirs from which epidemic prevalence spreads to outlying areas. And with respect to age, he says "there is undoubted evidence to show that in the poorer areas the disease tends to attack children at a younger age than in well-to-do areas, thus rendering poorer children at the higher ages immune from attack". The Chief Medical Officer to the Ministry of Health in the Annual Report for 1920⁵⁸, does not wholly agree with these views for he states:- "With respect to the distribution of the disease (Scarlet Fever), it does not appear to be so closely connected with extreme urbanisation as might perhaps have been expected, the figures as to London on the one hand, and the highly urbanised group of North Western counties (with their included County Boroughs) on the other, exhibiting a distinct contrast."

Again with reference to the herding of people together as a means of spread, Ross reporting on the epidemic in Dumfriesshire already referred to (page 48) says "a probable means of spread, whose importance cannot be exactly gauged, but which may be of considerable moment, was the picture-house. This institution was extremely popular, crowded at every performance during the outbreak, with a hot moist atmosphere particularly favourable to the spread of contagious disease of any kind."

The control of Scarlet Fever is accomplished

by:-

(a) General Sanitary Measures and (b) Preventive Measures.

(a) General Sanitary Measures are of universal application and there is no doubt of their efficacy in raising the standard of health amongst the people and also lowering the susceptibility of the individual. How for such measures limit Scarlet Fever is very difficult to determine, but it seems to be generally accepted that in its causation and dissemination this disease is little influenced thereby. Public Health measures have been in general directed towards the improvement of the environment of communities. Thus water supplies must be pure, drainage effective and nuisances prevented. The one insanitary condition which does play an important part is overcrowding whether it be of the people themselves, or of the housing, or both combined. This is due to the relative chances of contact being so much greater. It is therefore not surprising to find that in the crowded industrial county of Durham the number of Scarlet Fever cases per 1,000 of the population in 1919 was 4.57 while that of Oxfordshire was but 0.63.⁵⁹

⁵¹
Robertson has stated that the daily system of house-refuse disposal which prevails in Edinburgh exerts a preventive influence in the spread of Scarlet Fever.

Filth and damp in relation to dwellings have no effect on the spread of Scarlatina except in so far

as they tend to lower the resistance of the individual.

Much depends on the administration of each separate Public Health department. Most areas employ methods of investigation and control which are systematic but they are by no means exhaustive so that much of their value is lost. The following enquiries are essential:-

1. Patient:- Name and address, sex, age, date of onset, date of rash, present and past isolation, supposed origin of infection, cases of sore throat in the home, at school or amongst friends, any recent contact with persons or things known to be infected
2. Household (including patient):- Name, sex, and age, of each inmate, previous infectious diseases with dates and particulars of isolation in each case, occupation, place of work, day school or Sunday School, and dates of last attendance thereat, if recently been in crowded company, e.g., picture house.
3. Home Work.
4. Milk supply, water supply, laundry, and library.
5. Sanitary conditions of house and surroundings, specially noting any overcrowding, insanitary conditions of dustbins, pavements, pipes and spouting, water closets; if any animals kept: any fleas or vermin.

6. Previous cases of disease in the home or neighbourhood, or at school or workplace.

A more detailed form of enquiry is set out in the appendix A (page 86).

When a case occurs it is the duty of the Medical Officer of Health to make full investigation as to the possible sources of the disease and to advise as to measures which appear to him necessary in preventing its tendency to spread. Besides a knowledge of general medicine, it is necessary that he should have special training in preventive medicine. A sound working knowledge of bacteriology, epidemiology, etiology, symptoms, and sequelae is necessary, and he should also have access to a well-equipped laboratory in order to aid his researches.

(b) Preventive Measures.

1. Education of the public as to their responsibilities and also as to simple prophylactic measures.
2. Control of school attendance, picture houses, and the like.
3. Regulations of milk supplies, and industries.
4. Compulsory notification of all cases suffering from Scarlet Fever and also of those suspected to be "carriers".
5. Isolation.
6. Disinfection.

1. The public today are well aware that sufficient wholesome nourishing food and an open life are safe and simple means of maintaining individual resistance to disease generally, yet where children are concerned these measures appear not to coincide with popular notions of medical fitness and are therefore accepted and practised by only a minority of the population. It is not too much to say that even from the early months of infancy, children's constitutions are frequently undermined through inappropriate dietary given either for the sake of convenience to the mother or as the result of some neighbouring busy-body's ignorant advice. And again, while parents and guardians admit the great benefit derived by their children from open air life over a few brief weeks of summer they are quite unwilling to allow their children the open air life of the rest of the year. In poorer class districts where children are early left unattended and consequently are out of doors more throughout the year we find that these children are not affected in so great a proportion as those of better class areas where the children are largely kept indoors through the winter months. It has already been noted (page 52) that it is during the very early years that the children of poorer class districts are affected the more, that is to say, during the years that their parents give them more attention and keep them indoors especially through the colder months.

60

Hill's observations, confirmed by Cook and Winslow, on the changes in the nasal mucous membrane under outdoor conditions and under conditions of heating and ventilating which are not uncommon in rooms, show conclusively how in those who live out of doors offensive bacteria inhaled through the nose are either washed away or destroyed and thus kept out, while in those living the indoor life he finds the nasal mucous membrane offers a medium suitable for bacteria to grow on with the consequent greater liability to infection. It is reasonable to

suppose a similar conclusion would be arrived at were the naso-pharyngeal mucous membrane to be examined. 61 And further, Benians has shown that mucin is probably the first line of defence in the nose and throat, as throughout the rest of the alimentary tract. He states therefore that it seems not improbable that an attempt to turn the natural mechanisms of prevention to account, might actually prevent infection occurring.

These deductions indicate that the public should be educated to practise open air life the whole year round for both themselves and their children and that both should habituate themselves to daily routine attention to the hygiene of nose, throat and mouth as the most useful prophylactic for Scarlet Fever as also for such infections as coryza, diphtheria, influenza and the like.

It would materially aid in the

control of Scarlet Fever, were parents and guardians taught to recognise mild cases and, if in doubt, to seek immediate medical advice. It needs to be borne in upon the public that as a means of spreading the disease the mild cases are of greater danger than the severe ones. Valuable time would be saved if each suspicious case were isolated until such time as a diagnosis is made. Should it then prove that the patient is suffering from Scarlet Fever, notification, compulsory by law, should be made at the earliest possible moment.

Instructions in all duties and responsibilities may be given by health visitors, sanitary inspectors, and the medical officer of health, by means of personal visits, lectures and by distributing printed matter. Through such agencies attention should specially be drawn to:-

- (a) Food
- (b) Fresh air and ventilation.
- (c) Cleanliness with special reference to the simple hygiene of throat, nose, and mouth; and the significance of discharges from ear, nose, and so on.
- (d) Infectious Diseases Notification Act.
- (e) Public Health Act (secs. 50-59, Scotland).
- (f) Isolation.
- (g) Disinfection.
- (h) Recognition of mild cases.
- (i) Desquamation.

2. Control of School Attendance.

Numerous examples bearing out Holt's ⁶² statement that schools are hot-beds for the spread of Scarlet Fever are to be found. Shirley Murphy ⁴⁹ for instance, has shown that at school ages cases are

lessened by holiday. In Nottingham it was found that far fewer attacks began on Wednesday than on any other day of the week, owing presumably to lessened opportunity of infection on Saturday and Sunday.⁴⁹

Lennane (M.O.H. Battersea) in his annual report of 1908 says "the influence of schools as a means of spread is considerable. The fact that during 1908, out of 1099 cases notified, 714 were children of school age (5 to 15 years), points to the school as a channel for the dissemination of the disease. The effect of environment in this respect affords additional evidence that schools do play a most important⁶⁴ part". "This is mainly due to the presence of mild cases in the schools being unrecognised or similar cases may occur at the homes of children attending schools."⁶³

⁵²Nash says "I am convinced that, but for school influences, there would be a very marked and immediate diminution in the number of cases, and it is to be hoped that medical inspection of school children will not only result in the early detection of those actually affected, and those most likely to be infected (such as children with adenoids, enlarged tonsils etc.) but will secure ample cubic air space for each child, and the maintenance of efficient ventilation in School."

⁶⁵Chalmers (Glasgow) in his annual reports has given tables arranged to show the influence of school holidays on case incidence. Appended is the

table for the year 1909:-

Periods.	Cases notified				Increase or Decrease.				Total.				
	Age 0- 5		Age 5-14		Age 14 and over.		Age 0- 5		Age 5-14		Age 14 and over.		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
1. May 19th to June 30.	76	68	119	123	39	40	-	-	-	-	-	-	465
2. July 1 to Aug 17.	58	59	102	124	27	37	-18	-9	-17	+1	-12	- 3	407
							-27		-16		-15		
3. Aug. 18 to Sept. 29th.	84	87	204	240	32	39	+26	+28	+102	+16	+5	+2	685
							+54		+218		+7		

Chalmers points out "while there was a reduction in the number of cases during the six weeks the schools were closed, i.e., July 1st to August 17th, there was a very marked increase during the following six weeks. This may not be wholly due to school influence, but may be associated with the autumnal prevalence which is characteristic of this disease."

The Tyneside children have their summer holidays a good fortnight earlier than the above and the figures for the past ten years show that amongst children of the age group 5 years to 14 years, these holidays have a very decided effect in reducing the incidence of Scarlet Fever. For the five weeks before the holidays 82 such children were admitted to the Wallsend Fever Hospital during the past 10 years. For

the same period through the summer holidays of 5 weeks only 58 cases were admitted, or almost 33% less; while in the succeeding 5 weeks for the same time 87 cases were admitted, an increase of 50%, an increase not associated with the much greater prevalence of September and October.

There is no doubt that the open air life the children lead during the mild weather of the holiday season, in contrast to their more confined existence during the colder months, is an important factor in producing the above results noted by Chalmers.

Referring to the above table it shows that the largest number of notified cases is in children of school age (5 years - 14 years), and also that the increase after the holiday season is most marked in the same group.

Here and there systematic school inspection with its provisions for searching out all absent children, is showing how the effect of school attendance in spreading Scarlet Fever may be modified for the better. ⁶⁶ Cates (late M.O.H. St. Helens) arranged for nurses to visit daily each class in every school so that careful examination was made of any child who appeared to be ailing or concerning whose condition the teacher was anxious, and particularly all children were examined who came from homes in which there was infectious disease. This system of daily nursing supervision seemed sufficiently

comprehensive to allow for the regular attendance in school of all children coming from homes in which there was infectious disease, and, as an experiment the exclusion of contacts was discontinued. The scheme has now been in force for the past two years and among other successes claimed for it is the fact that there has been no evidence that Scarlet Fever has been spread in school through the agency of contacts.

⁶⁷
Hogarth has recommended a routine with the object of discovering mild or missed cases, the teacher allowing no readmission of any child who, having been absent a whole day or more, has been found to have had a sore throat while absent from school. Such a child on its return to school should be examined by the School doctor, and re-examined from time to time, its admission to school being allowed only on medical authority.

39

Hamer reports an outbreak of Scarlet Fever in Southwark in 1919 at a time when the prevalence of that disease was exceptionally low, and though the area affected was very limited, the incidence within the area was very high. As a means of preventing further spread of the disease, the infants' department of the Council's school central to the area, the records of which showed an excessive proportion of the flea-bitten children, was disinfected. The rooms and bedding associated with Scarlet Fever cases were also disinfected. "This action" Hamer says, "was followed by marked reduction of the prevalence of Scarlet Fever in the said area."

That schools are a very important means of spreading the disease is now well recognised by education authorities and in many instances they have instructed the teaching staff to keep a watch for "peeling hands", especially if associated with a history of sore throat a week or two before, and when detected to send the scholar home immediately for medical examination. Such a procedure, while excluding the scholar, does nothing to safeguard the public for the child is frequently taken through the streets or in a public conveyance to the Doctor's surgery; there to mix with others in the waiting room. Although there is a penalty imposed by Section 126 of the Public Health Act, 1875, for exposure of a person suffering from a dangerous infectious disease in a public place, it would be difficult if not impossible under present conditions to bring an action against any of the parties concerned. A better course would appear to be for the teacher to notify the health department directly of the occurrence of a case of this nature and thus throw the onus of diagnosis and custody on them but it is doubtful if such a course could be adopted as a matter of routine as few health departments are possessed of sufficient medical staff to cope with the numerous calls that would arise in the course of an outbreak of Scarlet Fever.

To prevent the spread of Scarlet Fever and other infectious diseases in school, the Board of Education in the Code for 1909 gives power to the

Medical Officer of Health and to the School Medical Officer in Articles 57 and 53 respectively, to close schools or exclude children from school when, owing to the prevalence of infectious disease, either procedure is deemed advisable. A Memorandum (1909) upon Public Health Administration for the Prevention of the Spread of Infectious Diseases occurring among children attending Public Elementary Schools, with special reference to the circumstances in which the closure of Schools or the Exclusion of Individual Scholars may be necessary, deals fully with the methods of procedure to be adopted in cases of Scarlet Fever amongst School Children. It further states that while Scarlet Fever in school usually spreads slowly from child to child as compared with measles, the diligent search for slight cases and supervision of "contacts" should in most instances render school closure needless.

Residential schools, such as those under the Poor Law, Industrial or Reformatory system, have a greater influence upon spread of infection than ordinary day schools. Such schools should be conducted on the best sanitary principles, especially with regard to cubic space in the living rooms and dormitories, separate lavatory basin, brush and towel, spray system of washing and so on.

The respective Public Health Acts lay down rules in regard to children attending school - see Section 57, Public Health (Scotland) Act. Local

application of this is to be found in Appendix B.
(page 87).

Sanitary Authorities have no general power in respect of Sunday Schools or other private schools but managers of such schools are usually ready to defer to the representation of the authority responsible for the public health of the district. Just as school aggregation is rightly blamed for spreading infection, it must be borne in mind that all gatherings or meetings of children must share the responsibility. Slowly the public is becoming aware that Picture Houses and similar places of amusement may be responsible for the spreading of fleas and it ought to appreciate the fact that such vermin is probably capable of disseminating Scarlet Fever. Besides this, there is as a rule, much overcrowding in these places of entertainment and the changes of air are few, both of which conditions facilitate the spread of infection by saliva sprayed out by people who may be suffering from a mild attack of Scarlet Fever or who may be carriers of the disease. Circular 120, 25th August, 1920, of the Ministry of Health deals mainly with the provision of satisfactory accommodation for artistes employed in theatres and picture houses and for default in this particular a licensee of such premises may have his license withdrawn. For the grosser faults of not preventing vermin, overcrowding, and bad ventilation in his premises no action can be taken.

Robertson reporting to the Birmingham Public Health Committee on April 14th, 1919, puts on record the fact that in some of the Cinema theatres the cubic space per person was only 50 cubic feet; carbon dioxide was present in 47 parts per 10,000; the temperature was 56° and the relative humidity 59. It is truly amazing that under such conditions so many people can attend these places of amusement without being infected. Greater powers are therefore needed to prevent these unfavourable conditions occurring and licensees of such places should be compelled to provide washable coverings for floors and seats, such coverings to be thoroughly washed daily, to provide a good sufficiency of cubic space per person attending their theatres and to install adequate ventilation so as to give a much greater number of air-changes at each session. Until such provisions are made, music halls and cinema theatres and the like must remain sinks of infection.

3. Regulation of Milk Supplies, Industries etc.

As already indicated, milk is a fruitful source of infection, the contamination usually being derived from the cuticle or discharges of another case.

Milk epidemics are recognised by peculiarities relative to the difference in the class of persons affected and also to the nature of the disease.

Class of persons affected:-

- a. Cases are most commonly in better class people as they consume more milk.
- b. Several cases occur simultaneously in one house, milk drinkers being the only ones affected.
- c. Infected households have a milk supply common to each other.
- d. Most of the cases arise simultaneously.
- e. Those who boil the milk before use are unlikely to be affected.

Nature of the Disease:-

- f. The epidemic has a sudden onset and an abrupt cessation.
- g. The disease is of a mild nature and has a low mortality.

The prevention of spreading Scarlet Fever by this means, lies in the hands of farmers and milk dealers on the one side and in the hands of the consumer on the other. With farmers and milk dealers much has been done towards the production of a pure milk supply by making them comply with the Dairy Orders, the Milk Regulations and the Sale of Food and Drugs Act; and locally they are required to meet byelaws framed by their own Sanitary Authorities. In spite of all this legislation it is well known that the country's milk supply remains very impure and the Milk and Dairies (Consolidation) Act of 1915 together with the Food Controller's Order of 1918, under the Defence of the Realm Act, arranging for the grading of milk are therefore further attempts to procure for the public, fresh, wholesome milk. Though our milk supply still remains in urgent need of attention, the

above measures have been largely instrumental in awakening farmers and milk dealers to the great importance of clean and effective dairying at the farm and at the retail dairy, and also to the great advantages derived from improved methods of distribution.

It is a matter of doubt whether the consumer, especially in industrial areas, is yet aware of the elementary means of taking proper care and protection of milk when it arrives at the home. Either from ignorance or from carelessness, he allows the milk to stand in crowded insanitary rooms, the receptacle in which it is contained being open to countless filthy flies. In such cases (and they are very numerous), it is doubtful whether even the dried milk preparations are of any benefit, for though in the dried state they may be "germ free" it is highly probable that, when made up for drinking purposes and exposed to the unclean conditions already mentioned, this milk too, readily becomes contaminated and a source of infection.

Industries (especially home-work) such as tailoring, washing, nursing, and all work involving the handling of food or clothes, must be forbidden as long as a case remains in the house, but only for a quarantine period if the case is removed to Hospital.

4. Compulsory Notification.

The law requires both the householder

and the medical attendant to notify "forthwith on becoming aware" cases of Scarlet Fever. In practice it is usually left to the medical attendant, who is, as a rule, only too glad of the co-operation of the Sanitary Authorities. If there is no doctor in attendance, the duty devolves on the householder. This dual notification should be insisted upon as it would often lead to earlier action being taken by the Medical Officer of Health and very valuable time saved in the early and highly infectious stages of the disease, and spread prevented.

Failure to notify incurs a penalty.

5. Isolation. (a) at home. (b) in Hospital.

The main essentials in treating an infectious disease such as Scarlet Fever are first to place the patient in the conditions most favourable for combating the disease and secondly to prevent infection spreading from the patient. The question now arises as to the relative merits of home or Hospital isolation. While the general consensus of opinion is decidedly in favour of Hospital treatment there are yet people who consider home isolation gives satisfactory results. Remmett Weaver⁶⁸ (M.O.H. Abertillery) states that on receipt of the notification, the house is visited and the person in charge of the patient is instructed as regards isolation and disinfection. Besides this, instructions as to a modified form of the Milne method of treatment are given. This Authority states

that the results of these measures justify its continuance. And again, Macdonald (M.O.H. Chelmsford rural district) writes:⁶⁹ - "It is not unusual to find that a child can be segregated in a small cottage with other children occupying the adjacent rooms without a second case occurring". My own experience of home isolation, especially in colliery or other industrial areas, leads me to the conclusion that it is more or less a sham from the very imperfect way in which it is understood and carried out. As long as there is infection, isolation is imperative, and this being so, it ought to be done thoroughly and that, I believe, can best be done by removal of the patient to Hospital. But whether carried out at home or in Hospital, the duration of isolation corresponds to the duration of infection which has already been discussed.

A. The essentials of home isolation consist of:-

(1) The complete separation of the sick from the healthy.

This is provided for by placing the patient and the nurse in a room or rooms as far from the other members of the household as possible, preferably on the top floor. Such rooms as are selected should be devoid of unnecessary articles such as curtains, carpets, upholstery and the like, should be freely ventilated, provided with plenty of sunlight, with a fire in colder weather partly for warmth and partly for ventilation, and kept as clean as possible. It is

usual to advise the nurse to hang a sheet (kept wet with disinfectant) over and covering the doorway in order to prevent infected air from the sick room entering the house. The use of such a sheet is, if anything, injurious to the patient who is constantly breathing an atmosphere fully charged with moisture, and the skin's proper action is prevented. Moreover, beyond the fact that the sheet reminds other members that there is a case of Scarlet Fever in their near vicinity, it affords them no protection. It may perhaps prevent them from coming into personal contact with the patient and for that reason it still has its use. (ii) Children in the house who have not been exposed to the disease should be sent away at once, and those who have been exposed should be separately quarantined for at least a week. (iii) The nurse should not be allowed to mingle with other members of the household until a complete change to non-infected clothing has been made, and hands and face thoroughly disinfected. Once or twice daily the nurse should douche her nose and throat, and wash out the mouth. (iv) The Medical attendant should wear an overall while in the sick room and disinfect his hands before leaving. If his ordinary clothes are exposed to infection, they should be changed before coming into contact with other children. (v) Visitors, especially children, should, under no circumstances, be allowed within the infected house, but there is no power to enforce this by law, or to

inflict punishment in case of default. Exposure of infected persons or articles, however, carries a penalty. (vi) All milk should be boiled so as to prevent infection reaching other members of the household. (vii) Bedclothing, towels, dishes, spoons, and all other utensils used in the sick room are to be kept apart and made use of by no one but the patient. This applies also to any food which has entered the sick room and no food should remain in the sick room. (viii) After recovery, patients should not be allowed to mingle with other children for a period of two to four weeks and should sleep alone for at least three months. (ix) Cats, Dogs, and other domesticated animals should be prevented from carrying the infection. They should be preferably boarded out, (after a disinfectant bath if exposure has taken place) during the isolation period. Pets of this description often come in very close contact with the patient frequently lying on the bed, and no thought is given to the risk.

B. Hospital Isolation as at present practised is not truly correct.

Certainly the case is isolated from the community at large, but when placed in a ward along with other cases it becomes a question of aggregation rather than of isolation. Surely if an isolation Hospital is to fulfil its real purpose it must not only segregate its cases from the community at large, but each case must be isolated from the others. Each

case must be regarded as possibly harbouring some form of infection communicable to its neighbours. It therefore becomes a matter of administration as to whether this better isolation can be done efficiently in a general ward or by providing separate cubicles as at the Pasteur Hospital in Paris.

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Crookshank (M.O.H. Barnes) rightly advocates that all isolation Hospitals, both in material and administration, should be brought up to surgical pitch (if not already so) and thus enable complete asepsis to be practised both by doctors and nurses. This is a matter of primary importance in preventing cross infection and in obtaining the best results. As an aid to this practice there must be sufficient cubic space provided (the minimum requirement of the Late Local Government Board was 2,000 cubic feet and the floor space 144 square feet per patient), and the beds in a general ward arranged so that the head of each may be as far apart as possible. This is best accomplished by increasing the length of the ward at the expense of the breadth. Wards should be built, if possible, as one storied pavilions with windows at each side, and placed in such a direction as to obtain at all times the maximum of sunlight. Ventilation should be provided for by natural and artificial means, as well as by cross ventilation between opposite windows. The necessary warmth may be maintained by a combination of open fire-places and hot-pipes.

One of the advantages of removal to Hospital is that the time may be spent in the open air provided the weather is suitable and the patient can be kept sufficiently warm in bed. This open-air treatment lessens the susceptibility to "cold in the head" when the patient is discharged from Hospital. The septic cases should be kept apart from others in Hospital at any rate until the acute stage is over, and in all cases when this is past and all danger of Scarlatinal Nephritis averted, they should be removed to a convalescent ward. This allows of dilution, so to speak, of infection and prepares the way for dismissal in a pure state.

When a patient has no longer any clinical signs of infection he should be prepared for departure, detention in Hospital being for as short a period as is consistent with safety. The effect of this is to lessen the number of "return-cases".

The method of discharge should consist in undressing in a special apartment, a thorough bathing in an adjoining bathroom, and a complete change of clothing put on in a third room kept only for this purpose. This should be followed by a night's rest in a non-infected room before the patient is allowed to depart. The case of C.E. already referred to (page 14) illustrates the importance of this precaution. This patient was bathed in warm water in a closed-in bathroom at 8 a.m., and within two hours of this she was sent home along a very exposed

road on a cold rainy morning. On the evening of the same day she complained of earache affecting the right ear, and the next morning Otorrhoea was present and a "return case" followed within four days of her leaving Hospital.

On discharge, parents or guardians should be given certain instructions with respect to the patient. For the past six months I have made it a practice to get all convalescent cases to gargle with a weak solution of Sodium Chlorinata after food and also to douche out the nose and naso-pharynx morning and evening, with a mixture of Sodium-biborate and Sodium bicarbonate dissolved in water. Having cultivated these habits before leaving Hospital it is an easy matter for patients to continue them after leaving Hospital and to make certain this is done the parent or guardian is given a small bottle containing about half an ounce of Sodium Chlorinata (full strength) and a small package containing a mixture of the two other sodium salts already mentioned. Instructions for use are written on the bottle label and the package respectively, and a short notice of precautions to take with the discharged patient is given to the responsible person. A copy of the notice will be found in Appendix C. Though it is at present early to judge the results of these measures it is of interest to learn that, though the period includes the post-holiday weeks during which Scarlet Fever is so prevalent, no return case has occurred since this

method was adopted.

The question of the value of isolation Hospitals in preventing Scarlet Fever was raised by ⁷¹Wilson and afterwards investigated by ⁷²Millard whose research would indicate that Hospital isolation has no effect in reducing its prevalence. Chapin (Superintendent of Health, Providence R.I. , U.S.A.) dealing with the Evolution of Preventive Medicine, ⁷³remarks that it was frankly hoped in years gone by that isolation would come near stamping out Scarlet Fever. It is true however, that the disease is almost, if not quite, as prevalent as in former years but the number of deaths has decreased most remarkably. This non-reduction of prevalence may appear surprising, but it is largely due, I believe to administration. In order that an isolation Hospital should fulfil its function, cases in the homes not only require to be notified earlier but removed more expeditiously than has been the custom especially in smaller urban and rural districts. And further, as has already been pointed out, Hospital administration and management must be brought up to surgical pitch. Difficulty of diagnosis especially in mild cases, the negligence of the public in sending for a Doctor, and the great difficulty in finding contacts and keeping them under proper supervision are other important factors in rendering isolation ineffective in reducing the incidence of Scarlet Fever.

Niven (M.O.H. Manchester) in his Annual Report for 1901 gives an exhaustive analysis, in which it appeared that Hospital is really instrumental in diminishing the incidence of Scarlet Fever.

Two interesting papers on this subject are written by Newsholme⁷⁴ and Aldwinckle⁷⁵. That Isolation Hospitals have been, at least instrumental in reducing the mortality, is summed up in the final report of the Royal Commission on Vaccination, where the Commissioners say:- "We think that the steps which have been taken in various ways, to isolate persons suffering from Scarlet Fever, have largely contributed to this decline while dissenters tell us without hesitation that regarding Scarlet Fever in London, the development of Hospital isolation has been most strikingly effectual in reducing almost to insignificance, the mortality."⁷¹

It is reasonable to assume that the longer a case is left at home without isolation, the more chance there is of spread. A case in point occurred recently in my own district. A little girl, aged 3 years, the daughter of a collier, took ill and the Doctor who visited, stated to the parents that the disease was Scarlet Fever and would necessitate the patient's removal as their two-roomed flat was unsuitable for isolation. This occurred on a Thursday evening but the notification form was not posted until Saturday night nor delivered till

Monday. Certainly the child was removed at once but within a week of her being sent to Hospital, her brother aged 5 years, developed Scarlet Fever and was sent to Hospital. The father also continued his work during this interval and it is impossible to estimate how much harm was done. Such negligence, I believe, does not often occur, but with easy telephonic and telegraphic communication, the Public Health Department, should demand more expedition. This is an example of a case, which would have arrived earlier in Hospital, had both parent and Doctor notified it and who can tell but that even secondary infection may have thus been prevented?

As another means towards efficiency, isolation hospitals should be provided with small side rooms where doubtful cases, or cases of mixed infection, may be isolated separately. I am aware that such side wards do exist in some of the large fever hospitals throughout the country, but no provision is made for doubtful cases in the majority of the smaller hospitals and in these, difficulty arises with the placing of a doubtful case, or a case of Scarlet Fever plus Diphtheria or a case such as

76

Foord Caiger records in which four diseases, Scarlet Fever, Whooping Cough, Measles, and Diphtheria were co-existent. That Hospital isolation is appreciated both by the profession and by the public is shown by the increase in numbers admitted year by year. Thus in Edinburgh in the year 1890 only 40 per cent of

Scarlet Fever cases occurring in the City were removed to Hospital. In 1920 of the 1,459 cases of Scarlet Fever notified in the City no fewer than 1,435 were treated in the City Hospital, giving a percentage of 98 of the total cases.

The adoption of the cubicle system for the isolation of cases on admission has frequently been advocated, such cases on recovery being removed to a general ward. While this may be, and is, I believe, a reasonable object to be aimed at, I yet think that it is not more isolation of the sick that is needed so much as the isolation of more people, especially the isolation of all those cases now called "missed".

Removal to Hospital should only be done in a vehicle kept for the purpose and which can be easily disinfected. A case happened in my district in May, 1921, where a man, suffering from sore throat with typical Scarlet rash called at his Doctor's surgery but finding the Doctor away from home, he went by tramcar a distance of a mile or more to another Doctor in the district to find that his own suspicions were only too well founded. He was detained in a separate room and the infectious diseases van was at once sent for and later conveyed him to Hospital. Several cases I have known walk through the streets of the town to Hospital after being informed by the Doctor that they have been suffering from Scarlet Fever.

6. Disinfection.

- a. Of the home.
- b. Of the patient.
 - i. During sickness
 - ii. After recovery or death.

a. Disinfection of the house should always be carried out under the direction of, or directly by the Sanitary Authorities. Disinfectants are usually supplied gratis during the illness, and should be used freely. Floors and woodwork generally should be kept clean by washing with dilute disinfectant. Spoons, dishes, towels, bedclothes etc., should be steeped in disinfectant and afterwards boiled. The infected room or rooms should be kept well lighted and ventilated and generally exposed to as much sunlight as possible.

All dust and rubbish should be burnt in the sickroom fire, and not removed to the ashpit. A wash-house common to other neighbours must not be used. Closets must be well rinsed daily with disinfectant. All milk should be boiled, especially if it be for children.

After recovery, all movable textile materials which cannot be boiled, including blankets, pillows, mattresses, curtains and carpets must be removed and disinfected by steam. The bed, chairs, table and other washable articles should be washed with dilute disinfectant after being first thoroughly scrubbed and cleaned with soap and hot water. Upholstered chairs and other articles should be put outside in bright sunlight, and afterwards brushed well, washed or beaten. The walls, ceiling,

floor and other surfaces should be washed, special attention being given to corners. The walls should be stripped of paper and the ceiling and walls white-washed and the woodwork repainted. The room or rooms after being thoroughly cleansed in this manner can best be disinfected by the use of formalin spray, the walls being sprayed from above downwards. This is followed by the opening of all windows and doors in order to get the room well aired and to get rid of the disagreeable formalin smell.

Books, toys, and other similar articles if of little or no value are best destroyed by fire. If this may not be done these articles must first be exposed to fumes of Sulphur di-oxide or other similar gaseous disinfectant and then put out in bright sunlight and open air.

If the patient be removed to Hospital at the very beginning of the illness, the Sanitary Inspector must use his discretion as to how much of the house and household goods will require disinfection. If removal has been delayed and the child allowed about the house, the whole of the house may need disinfecting. The bed and bedroom will, in every case, require the most thorough attention.

b. (i) During the whole of the isolation period the patient must receive special attention. The excreta and other secretions are to be received into a bed pan or other vessel containing suitable disinfectant and after a short interval emptied into the closet;

and never may slops in these cases be emptied into a sink. Old linen, gauze, or absorbent cotton or rags should be used in preference to handkerchiefs and burnt immediately. Soiled bedclothing should be steeped in disinfectant previous to washing.

The mouth, throat, and skin of the patient must receive special attention. The teeth must be cleaned by brushing, using a mild antiseptic for the purpose. The throat should be swabbed out, painted or sprayed according to the severity of the case, a disinfectant such as Listerine or Compound Thymol lotion, being used for this purpose. This is followed by cleaning of the buccal cavity, tongue and lips, with similar antiseptic, the tongue and lips in the acute stages being afterwards smeared with a mild, palatable antiseptic ointment.

The importance of thorough and early attention to the throat cannot be too much insisted upon for it has been my experience that Scarlet Fever throats, if left untreated, rapidly go to the bad. Nor is this merely a clinical observation for Lee⁷⁷ has shown by means of the Schick re-action how susceptible to Diphtheria, Scarlet Fever patients may be.

It has been the practice in the Metropolitan Asylums Board's Hospitals for throats to be forcibly syringed out every few hours. If this is done, care must be taken that septic material is not injected into the eustachian tubes and so to the

middle ear.

The skin from the very commencement needs to be encouraged in its natural action by daily washing. The question of anointing the skin with eucalyptus oil as suggested by Milne³ (M.O. Dr. Barnardo's Hospital and Homes) is largely a matter of personal taste. My own experience of this method leads me to the conclusion that as far as modifying the incidence of Scarlet Fever goes it is a failure. I am assured by a medical colleague however, that in working class homes where isolation is out of the question, he has carried out this method for several years without experiencing secondary infection amongst other children in the house. If success is to be attained by adopting this line of treatment it is necessary to make an early start.

b. (ii) After recovery, a final bath should be given, the hair (preferably cut short) and scalp being well washed first with soap and warm water and then with a mixture of acetic acid, glycerine and spirit, and a complete change of clothing put on by the patient.

In case of death no "wake" is allowed, the body being interred as soon as possible and, if the death has occurred in Hospital, the funeral must take place from the Hospital and not from the house.

S U M M A R Y .

Remedies suggested for a more thorough control:-

1. Missed cases need to be systematically searched out and controlled by Public Health and school agencies, bringing about the necessary isolation of more people.
2. Home treatment should be altogether and always discouraged, if not prohibited.
3. A pure milk supply at a reasonable cost is needed an object that might well be attained by municipalisation.
4. Education of the public concerning the disease and especially concerning the value of fresh air, cleanliness and the simple hygiene of the nose, throat and mouth.
5. Notification in a more expeditious manner, together with the prompt and reliable notification by parents and guardians concerning their children's absences from School due to illness, the apparent nature of the illness being given.
6. Suspicious cases should be at once isolated until diagnosis is certain.
7. Susceptible children such as those with enlarged tonsils and adenoids, mouth breathers and those with naso-pharyngitis or carious teeth should receive early and requisite treatment.
8. Hospitals must truly isolate being brought up to a surgically aseptic standard.

9. Contacts should be dealt with according to law now in force in Scotland, viz., by isolation. Domesticated animals should be treated as other contacts. The prohibiting of people from knowingly making themselves contacts, e.g., visitors to infected houses.
 10. Larger local powers to deal with picture houses and similar places especially during the prevalence of epidemics.
 11. Legislation already in force to be more rigorously carried out and further legislation to be made on the above lines.
 12. Early diagnosis (exact clinical and bacteriological) would prove of incalculable value.
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Scarlet Fever.

	Patient					Medical Attendant
	Name and Address	Age	Sex	Occupation or School	Class	

Register of Dates

Visit	Notification	Onset	Last Attendance at			Hospital Case			Disinfection
			Work	School	Isolated Area	Removal	Discharge	Re-examination	

Notes on Case

First Symptoms	Supposed Origin	Cases of Sore Throat		
		Home	School	Friends

If treated at Home, Means of Isolation	Milk Supply	Water Supply	Laundry	Library	Other Cases in family or Neighbour- hood: at work or school.

Occupancy of Premises					No of Rooms				
Name	Age	Sex	Occupation	Work or School	Class	Living		Sleeping	
						Floor	Rooms	Floor	Rooms
						Basement		Basement	
						Ground		Ground	
						1 st		1 st	
						2 nd		2 nd	
						3 rd		3 rd	
Total No of Rooms:									
Rent						No of Tenements			

* Indicates that the person has previously suffered from the disease

Water Closets							
Position	Description	Flushing Apparatus	Dustbin	Roof & Gutters	Pavement	Waste Pipes	Soil Pipe

General Sanitary Appearance	Animals kept & if scrupulously clean	Name & Address of Owner of Agent	Remarks.
			Inspection made by

APPENDIX B.SCHOOL EXCLUSION REGULATIONS.

SCHOOL MEDICAL DEPARTMENT

TOWN HALL,

WALLSEND-on-TYNE.

REGULATIONS FOR THE EXCLUSION OF CHILDREN FROM SCHOOL
ON ACCOUNT OF INFECTIOUS AND CONTAGIOUS DISEASES.

DISEASE.	When Patient has been removed to Hospital.		
	PATIENT	OTHER CHILDREN IN HOUSE.	
SCARLET FEVER	At least 2 weeks after discharge from Hospital, except in special cases, when 4 weeks should elapse before being admitted to School.	Two weeks after date of disinfection.	
	When Patient is nursed at home.		
	PATIENT	OTHER CHILDREN IN HOUSE.	REMARKS.
SCARLET FEVER.	At least 2 weeks after date of disinfection except in special cases where 4 weeks should elapse before admittance to School is allowed.	Two wks. after disinfection	When there are mucous discharges. X. X - Excuse School.

APPENDIX C.

Instructions given to parents or guardians of patients on being discharged from Hospital.

BOROUGH OF WALLSEND.FEVER HOSPITAL.

No patient leaves Hospital until free of the fever from which he or she has been suffering.

Patients discharged may yet be capable of spreading the disease to others. You can prevent this by:-

1. Avoiding cold on the journey home;
2. Keeping patient apart from other children for one week after leaving Hospital;
3. Making patient sleep in separate bed from others for one week after leaving Hospital;
4. Not allowing fondling or kissing of patient;
5. Bathing patient daily;
6. Making patient gargle and wash out nose as directed;
7. Consulting family Doctor if patient become indisposed.

If possible the patient should be sent away to the country for a week or two.

A P P E N D I X D.VISITORS' CARD FOR HOSPITAL.B O R O U G H O F W A L L S E N D.HOSPITAL FOR INFECTIOUS DISEASES.

Patients very seriously ill will have their condition notified directly to nearest relatives or to those most concerned.

Otherwise no patient may be visited in Hospital until sufficiently convalescent, and then patients may be seen once fortnightly - on Sunday between the hours of 2-30 p.m. and 3-30 p.m.

At this hour also the Matron may be seen by friends of patients who are not sufficiently convalescent to have visitors.

Flowers, books and toys, may be brought to Hospital by patients' visitors, but no food of any description should be taken for patients.

This card admits only one person, who, when visiting must produce it at the Hospital gates.

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